

Chapter 8

Sealing and Painting of Thermal Spray Coatings

8-1. Introduction

Sealing and painting of the thermal spray coating system is often performed to improve performance or to achieve a desired appearance. Effective sealers have specific characteristics. Different types of sealer materials should be used depending on the exposure environment and the type of thermal spray metal. Recommended sealer systems for use over zinc, aluminum, and 85-15 thermal spray coatings are identified in Tables 5-1 (freshwater immersion), 5-2 (seawater immersion), and 5-3 (atmospheric exposures). Additional information on these materials for sealing and painting thermal spray coatings may be found in CEGS-09965 and EM 1110-2-3400. High-viscosity, thick film coatings should never be applied directly to an unsealed thermal spray coating.

8-2. Purpose of Sealers

Thermal spray coatings have porosities ranging up to 15 percent. Interconnected or through-porosity may extend from the coating surface to the substrate. Through-porosity may impair the performance of the thermal spray coating. Aluminum coatings less than 150 μm (0.006 in.) and zinc coatings less than 225 μm (0.009 in.) thick should be sealed for this reason. Sealers are used to fill porosity and improve the overall service life of the thermal spray system. Thermal spray coatings are also self-sealing. Over time, natural corrosion products fill the pores in the coating. Oxidation consumes a relatively minor amount of the metal coating. In some cases, sealing is performed to improve the appearance and cleanability of the thermal spray coated surface. Sealers reduce the retention of dirt and other contaminants by the thermal spray coating. In particular, the sealer may prevent the accumulation of corrosive salts, rain-borne corrosives, and bird droppings.

8-3. Characteristics of Sealers

Sealer materials should be low-viscosity products that flow and are readily absorbed into the pores of the thermal spray coating. Sealers should generally be low-build products that may be applied at low film thicknesses, generally 75 μm (0.003 in.) or less. The resin chemistry of the sealer must be compatible with the thermal spray metal. Some oleoresinous sealers may saponify if applied over zinc metal surfaces because of the alkalinity of the zinc. The selected sealer material must also be compatible with the intermediate and topcoats of paint if used. Sealers must be suitable for the intended service environment. The paint coats should also be applied to relatively low film thicknesses, generally not exceeding 125 μm (0.005 in.).

8-4. Types of Sealers

a. Vinyl. Vinyl-type coatings are well suited to sealing thermal spray coatings. They are compatible with most service environments including sea- and freshwater immersion and marine, industrial, and rural atmospheres. Vinyls are compatible with zinc, aluminum, and 85-15 coatings. They are very low-viscosity materials with low film build characteristics. Vinyl sealers should be applied to a dry film thickness of about 37.5 μm (0.0015 in.). Vinyl sealers are readily topcoated with vinyl paint. Subsequent coats of vinyl should be applied to a dry film thickness of 50 μm (0.002 in.) per coat. The vinyl sealer should be thinned 25 percent by volume with the specified thinner. The approximate viscosity of the sealer should be 20 to 30 sec measured with a No. 4 Ford cup viscometer in accordance with ASTM D1200 "Test Method for Viscosity by Ford Cup Viscometer." Gray (V-766e), white (V-766e), black (V-103c), red (V-106d), and aluminum (V-102e) vinyl finish coats are available.

b. Epoxy. Three types of epoxy sealers are used, coal tar epoxy (C-200A), aluminum epoxy mastic (CID A-A-3127), and epoxy primer/polyurethane topcoat system (CID A-A-3132).

(1) Coal tar epoxy (C-200A). Coal tar epoxy coating may be used as a relatively thick film single coat sealer for use over zinc, aluminum, and 85-15 zinc-aluminum thermal spray coatings applied to penstocks, spiral cases and extensions, draft tube liners, and surge tanks. The coal tar epoxy sealer should be thinned approximately 20 percent by volume and applied in a single coat to a dry film thickness of 100 to 150 μm (0.004 to 0.006 in.). The sealer is applied at a thickness suitable for covering the roughness of the thermal spray coating, providing a smooth surface that minimizes hydraulic friction.

(2) Aluminum pigmented epoxy mastic (CID A-A-3127). The aluminum epoxy mastic sealer is suitable for one coat use over zinc, aluminum, and 85-15 zinc-aluminum thermal spray coatings for use in marine, industrial, and rural atmospheres as well as for use over aluminum and 90-10 aluminum-aluminum oxide in nonskid applications. The aluminum epoxy mastic should be thinned to the maximum extent recommended in the manufacturer's written directions and applied to a dry film thickness of 75 to 125 μm (0.003 to 0.005 in.). This sealer provides an aluminum finish.

(3) Epoxy primer/polyurethane topcoat (CID A-A-3132). The epoxy sealer urethane topcoat system is suitable for use over zinc, aluminum, and 85-15 zinc-aluminum coatings exposed in marine, industrial, and rural atmospheres as well as for use on nonskid aluminum and 90-10 aluminum-aluminum oxide coatings. The epoxy sealer coat should be thinned to the maximum extent recommended in the manufacturer's written directions and applied to a dry film thickness of 75 to 100 μm (0.003 to 0.004 in.). The polyurethane topcoat should be applied to a maximum dry film thickness of 75 μm (0.003 in.). The polyurethane topcoat may be procured in a variety of colors.

c. Oleoresinous. Two types of oleoresinous sealers are used, tung-oil phenolic aluminum (TT-P-38) and vinyl-butyl wash primer/alkyd (SSPC Paint No. 27/ CID A-A-3132).

(1) Tung-oil phenolic aluminum (TT-P-38). The phenolic aluminum sealer is suitable for use over zinc, aluminum, and 85-15 zinc-aluminum thermal spray coatings exposed in marine, industrial, and rural atmospheres. The sealer should be thinned 15 percent by volume and applied to a dry film thickness of 37.5 μm (0.0015 in.). A second coat of the phenolic aluminum should be applied to the dried sealer to a dry film thickness of approximately 50 μm (0.002 in.). This sealer system produces an aluminum finish.

(2) Vinyl-butyl wash primer/alkyd (SSPC Paint No. 27/ CID A-A-2962). The wash primer-alkyd sealer system is suitable for use over zinc, aluminum, and 85-15 zinc-aluminum thermal spray coatings exposed in marine, industrial, and rural atmospheres. The wash primer coat sealer should be thinned according to the manufacturer's instructions and applied to an approximate dry film thickness of 12.5 μm (0.0005 in.). The commercial alkyd sealer coat should be applied over the dried wash primer coat at a dry film thickness of 50 to 75 μm (0.002 to 0.003 in.). This sealer system is available in a variety of colors and with a gloss or semigloss finish.

d. High temperature.

(1) Aluminum silicone (TT-P-28). The aluminum silicone sealer is suitable for use over thermal spray aluminum and 85-15 zinc-aluminum coatings used for high-temperature applications. The sealer should be thinned 15 percent by volume and applied to a dry film thickness of 25 to 37.5 μm (0.001 to 0.0015 in.). The dried sealer should be topcoated with a second coat of aluminum silicone paint to a dry film thickness of 37.5 to 50 μm (0.0015 to 0.002 in.). This sealer system provides an aluminum finish.

(2) Silicone alkyd. The silicone alkyd sealer is suitable for use over thermal spray aluminum and 85-15 zinc-aluminum coatings used for high-temperature applications. The sealer should be thinned 15 percent by volume and applied to a dry film thickness of 37.5 to 50 μm (0.0015 to 0.002 in.). The dried sealer should be topcoated with a second coat of silicone alkyd paint to a dry film thickness of 37.5 to 50 μm (0.0015 to 0.002 in.). This sealer system is available in a variety of colors.

8-5. Sealing and Painting

In general, surface preparation, thermal spray application, and sealing of a given area should be accomplished in one continuous work period of not longer than 16 hr. Subsequent paint coats should be applied in accordance with the requirements of the painting schedule. Surfaces to be sealed should first be blown down with clean, dry compressed air to remove dust. The thermal sprayed surfaces should be sealed before visible oxidation of the thermal spray coating occurs. Sealers should be applied by conventional or airless spray, except that vinyl-type sealers must only be applied by conventional spray. Spray application ensures the degree of control necessary to achieve thin, uniformly thick coatings. Thin sealer-topcoat systems are preferred to thicker films that may retain moisture and reduce the overall coating system life.